



# Fuel from the Fields

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Development, Design, Dissemination  
Case Study Series

This case study presents the MIT Charcoal Project during the early stages of implementation in Haiti and uses it as an example for performing a stakeholder analysis. In Haiti, wood charcoal is the primary source of cooking fuel, but its production contributes to deforestation and environmental degradation. A team of researchers at MIT devised a method for producing charcoal that uses the waste material from sugar cane processing to make an alternative form of charcoal. This case outlines their experiences during the initial field trials in Petite Anse, Haiti and challenges students to identify stakeholders and propose appropriate implementation strategies.

## Petite Anse

Petite Anse, a small fishing village in northern Haiti, is poor, even by Haitian standards. Government services are largely unavailable—most social and civil services are provided through local churches. Unfortunately, the churches do not have the resources to meet the needs of the entire community, and the majority of the population lives in extreme poverty. The village is crowded and few people have access to safe water, adequate sanitation or even rudimentary health services. In response to these needs, the Friends of Petite Anse (FPA) was formed and obtained funding to run a school and a clinic in one of the church buildings. The lunch provided by the school is the only decent meal that some of the children get each day. The programs sponsored by FPA are greatly appreciated by the local community, and FPA has a commitment to improve these services and expand them to provide more opportunities to the members of the community. Gerthy Lahens, the founder of the FPA, who currently lives outside of Boston, MA, was eager to introduce new technologies and opportunities for economic activity.



### **Haiti:**

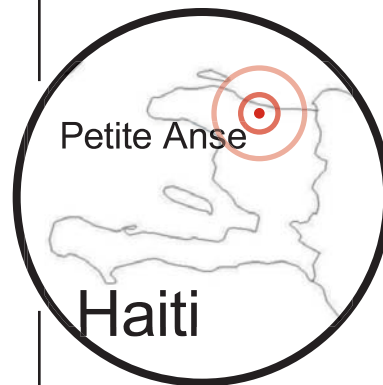
Population 7,656,166

Area: 27,560 sq. kilometers

Life Expectancy: 52 years

Average Per Capita Income: US\$500

Environment: Haiti is 98% deforested



### What is charcoal?

Charcoal is the product of incomplete combustion of organic matter. This occurs when the organic matter is heated in a low-oxygen environment, which causes the organic matter to be carbonized instead of burning away.

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### The Charcoal Field Trial

The MIT team arrived in Petite Anse to find that the church was well-prepared for their visit. Eager to get started as quickly as possible, they took stock of the available resources and found that the pastor of the church had arranged to have a truckload of bagasse delivered to the rectory. The supply of bagasse was plentiful; a sack of cassava root, known locally as manioka, had been purchased at the market. Members of the community were eager to help—sorting and drying the bagasse, peeling and grating the manioka, and preparing the kiln. Within a few hours, the first charcoal burn was underway.

The next morning, the air of anticipation was palpable as the team opened up the kiln to examine the results of the first burn. A crowd had assembled—in addition to members of the cooperative who had helped on the first day, other members of the community had come to watch, including Antonio Etienne, a local businessman who had gone to school in the United States. The results were promising, and the members of the community seemed encouraged by the sight of the charred bagasse and were eager to move on to the next phase—forming the briquettes.

As the cassava porridge cooked, Antonio voiced his excitement for the project, but he also raised concerns regarding the use of a food crop as part of the process. He explained that there might be local, non-edible plants that could act as a binder, such as the cactus that grew around the edge of the rectory yard. He went on to say that he could see a day when a larger, higher capacity briquette factory churned out hundreds of thousands of sugarcane briquettes for the masses. A member of the MIT team explained that the goal of the current incarnation of the project was maximizing job creation, hence the small scale, to which Antonio countered that a great factory producing briquettes would create far more jobs than a decentralized approach in rural Haiti. As the potential future directions for the project were debated, the first batch of over a hundred bagasse briquettes dried in the sun.



One of the poorer neighborhoods in Petite Anse, Haiti.



Cassava flour is made from the tropical root crop cassava (also known as manioka) which historically served as a basic foodstuff for rural inhabitants of Latin America and surrounding tropical regions such as Haiti. It is a very robust crop, as it can be relatively easily grown in infertile soil, and can withstand drought and other climatic changes.

*source: Dufour, 1996*

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The next morning revealed even better yields and quality of carbonized bagasse. However, later that day, Gerthy met with the MIT team; she was frustrated with the lack of interest in the project by the leadership of the church. The pastor, who was from a relatively wealthy background, did not see why people should go to the trouble of making charcoal for themselves, when they could just buy it in the market. Gerthy went on to say that she often had problems working with him, as she felt that he did not appreciate the dire conditions in which most of his parishioners lived, and that he cared more for their spiritual life than for their daily life. At fifty Haitian dollars or more per bag, buying charcoal was a drain on the meager resources of many of the villagers. Gerthy felt it was ironic that the pastor did not recognize that even those who worked at the rectory were struggling to make ends meet and that he was unaware of the situation that was literally in his own back yard.

There continued to be significant outside interest in the project, however. The archbishop of the region came to the rectory for a tour of the project, as did members of a local health organization. A doctor who was visiting from a neighboring district, was so taken with the project that he arranged to send some representatives from his village, which was almost 100 kilometers away, to come and learn what they could about the process.

On the last day in Petite Anse, the MIT team ran a training session, the “Ecole de Charbon”, which was attended by several youth in the neighborhood and the representatives from the doctor’s village. In the morning, the team explained the fundamentals of the process and walked through the details of production techniques. In the afternoon, the students did a charcoal burn on their own, with minimal intervention from the MIT team. After the class, the students thanked the team for teaching them about the charcoal process. As one student said, “I used to look at the piles of bagasse and only see waste, but now, I see that it can become something useful...” Another student, Rosemond, was particularly interested in the wider implementation of the project and talked about the possibility of setting up a youth corps to take the technology to the more rural areas and train farmers in the methodology.

### The (simplified) MIT Process:



#### **Making the kiln:**

Ventilation holes were cut in an empty 55 gallon oil drum. These holes allow air to flow through the kiln as the fire was getting started, and were later sealed off to provide to the low-oxygen environment necessary for carbonization.



#### **Carbonizing the bagasse:**

The drum was filled with dried bagasse and ignited. When the proper temperature was reached, indicated by a change in the color and quantity of smoke produced, the kiln was sealed. After several hours, the bagasse was converted into charcoal.



#### **Forming the briquettes:**

The carbonized bagasse was moistened and then crushed into a powder. A binder was made by boiling grated cassava root to form a sticky porridge. The binder was mixed with the charcoal dust, and then hand-formed into briquettes.



#### **The results:**

After drying in the sun for about a week, the briquettes hardened considerably and were ready for use.



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Tests showed that the sugarcane charcoal was able to compete with wood charcoal on an energy density basis, and a rough economic analysis showed that it could be produced for about a third of the cost of the wood charcoal available in the local market. With these promising results of the first field trials, the MIT team was excited about moving forward with a pilot project.

1. As a first step towards determining an appropriate strategy, use the attached worksheets to perform a stakeholder analysis for the charcoal project.
2. Develop a strategy for implementing a pilot charcoal project in Petit Anse or the surrounding area.



Students of the “Ecole de Charbon”

#### References

1. Warwick, Hugh and Alison Doig. “Smoke – the Killer in the Kitchen”. ITDG Publishing, London, 2004.
2. Betts, Kellyn S. “How Charcoal Fires Heat the World”. Environmental Science and Technology Online. ACS Online. Article Published April 3, 2003. Accessed September 9, 2004. <[http://pubs.acs.org/subscribe/journals/esthag-w/2003/apr/tech/kb\\_kenya.html](http://pubs.acs.org/subscribe/journals/esthag-w/2003/apr/tech/kb_kenya.html)>.
3. D. Dufour, ed. “Cassava Flour and Starch: Progress in Research and Development”. CIAT Publication No. 271, December 1996, Printed in Columbia, 1996. ISBN 958-9439-88-8. Accessed via internet at<[http://www.ciat.cgiar.org/agroem\\_presas/pdf/cassava\\_flour\\_session1.pdf](http://www.ciat.cgiar.org/agroem_presas/pdf/cassava_flour_session1.pdf)>on September 9, 2004.